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# PATENT SPECIFICATION



Application Date: Jan. 25, 1922. No. 6722/23.

196,877

Complete Accepted: April 25, 1923.

## COMPLETE SPECIFICATION.

### An Improved Water Sprayer.

I, DONALD ELDER, of Grey Street, Onehunga, in the Provincial District of Auckland, in the Dominion of New Zealand, a subject of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 This invention relates to sprayers used for watering gardens, lawns, and other areas of land.

The object of the invention is to provide an improved construction of sprayer capable of being adjusted to thoroughly water areas of any shape.

According to the invention the sprayer comprises a turbine fitted with a discharge nozzle and operated by water passing to the latter, to drive gearing whereby the sprayer is given rotary motion.

The rotary motion can be continuous in the one direction or be such that the sprayer will make a full revolution first in one direction and then a full revolution in the reverse direction, or said sprayer can be caused to operate backwards and forwards through any desired portion of a circle.

In order to cause the sprayer to reverse its movement about a vertical pipe a reversing clutch is provided in the gearing between the turbine shaft, and the stationary worm wheel, the latter containing holes arranged in a circular track around the vertical pipe.

When it is desired that the sprayer shall make a complete revolution in one direction and then a complete revolution in the opposite direction, a pin or peg is inserted in a hole in the stationary wheel. This pin or peg is located in the path of travel of a clutch arm, which when it strikes said pin or peg causes the clutch to be reversed and the sprayer to turn in the opposite direction until the pin or

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peg is again encountered, whereupon a further reversal is brought about and the sprayer is caused to again revolve about the vertical pipe in the same direction as it first did.

If on the other hand the sprayer is required to operate backwards and forwards through portion only of a circle two pins or pegs are inserted in the worm wheel the necessary distance apart, and each time the clutch arm strikes either pin or peg, the movement of the sprayer about the vertical pipe is reversed.

In order to accommodate the sprayer or rather the jet of water from same to areas having irregular outlines or boundaries, a nozzle containing a cock is employed, the discharge end of said nozzle having projecting therefrom a rigid arm kept in contact with a stationary regulating plate on the upper end of the vertical pipe. This plate is given a shape or outline which corresponds with that of the area of land to be watered. As the sprayer rotates about the vertical pipe, the arm of the nozzle is dragged along the edge of the regulating plate and rides over the projections on and enters the depressions in the latter, whereby the discharge end of the nozzle is raised and lowered to regulate the throw of the water to the outline of the area and also to regulate the volume of water issuing from the nozzle.

Means for causing the jet of water to be broken into spray, comprise a rocking arm working by a cam driven from the turbine shaft, so that an adjustable screw in the upper end of the arm is moved backwards and forwards through the issuing jet of water.

The invention will however be more particularly described with the aid of the accompanying drawing wherein:—

Figure 1 is an elevation (broken) of the sprayer.

Figure 2 is a plan view of same.

Figure 3 is a sectional plan view taken on the line A—A, Figure 1.

Figure 4 is an inverted plan view of portion of the reversing clutch actuating mechanism.

Figure 5 is a part plan view showing the sprayer constructed so as to rotate continuously in the one direction, while

Figures 6 and 7 are a plan view and a cross sectional view respectively of the reversing clutch.

Figure 8 illustrates a plate for regulating the volume of water and the altitude of the stream of water when watering an area having a shape similar to that of the plate.

According to the invention the vertical pipe 1 which preferably is fitted in a suitable stand or base has screwed in its upper end a tube 5 closed at its upper end upon which is a vertical stud 5<sup>a</sup>.

A hollow fitting 3 having in its upper end an opening which fits the stud 5<sup>a</sup>, and in its lower end an opening which fits the tube 5 is rotatable about the latter, an annular space 4 being left around the tube 5.

The tube 5 contains one or more ports 6 which open into the annular space 4.

Water from the pipe 1 passes through the tube 5, ports 6 and annular space 4 into the branch 7 which is connected with the inlet 8 of the casing 9, so that the latter is rigidly supported and capable of being rotated about the pipe 1.

The casing 9 has an outlet 10 to which is fitted a nozzle 11 containing a plug cock 11<sup>a</sup> directed over the vertical pipe 1, the portion 12<sup>a</sup> of said cock providing the mouthpiece of the nozzle.

The mouthpiece 12<sup>a</sup> is provided with a rigid and downwardly projecting arm 12, held by means of a spring 13 attached at one end to said arm 12 and at the other end to the fitting 3, in contact with the edge of the regulating plate 14, held stationary on the upper end of the tube 5.

The plate 14 has an outline shaped to correspond with the outline of the area or the portion thereof to be watered and as the sprayer is rotated about the pipe 1, the arm 12 is forced by the spring 13 into any depressions or recesses there may be in the edge of the plate 14, the result of which is that the mouthpiece 12<sup>a</sup> of the nozzle 11 is depressed and causes the cock 11<sup>a</sup> to reduce the volume of water, issuing from the mouthpiece and at the same time to shorten the throw of the water from the nozzle. As the arm 12 rides over any projections on the plate edge, the mouthpiece 12<sup>a</sup> of the nozzle 11 is elevated which allows the volume of water to be increased and causes the throw of water to be lengthened.

By these means both the volume and the throw of water from the nozzle 11 are regulated to at all times keep within the limit of the area being treated and to evenly water the whole area providing that a plate 14 having an outline corresponding with that of the area being treated is provided for the arm 12 to work against.

The turbine contained in the casing 9 comprises a vertical disc 15 having a boss or hub 15<sup>a</sup> keyed on the shaft 16.

Projecting at right angles from the disc 15 and a short distance from the edge thereof is a circular wall 17, whereby an annular space 18 surrounding the boss or hub 15<sup>a</sup> is provided.

The turbine blades 19 are fitted to the disc 15 and circular wall 17, outside the latter, said blades being curved to meet the water entering the casing 9 through the inlet 8.

Ports 20 through the wall 17, between the blades 19 open into the annular space 18 enabling water to enter the latter.

Water on entering the casing 9 through the inlet 8, fills the space 18 after which incoming water can only escape by way of the outlet 10, and in doing so acts on the blades 19 and drives the turbine in the direction indicated by the arrow in Figure 1.

On one end of the turbine shaft 16 is keyed a worm 21 which drives a worm wheel 22<sup>a</sup> in turn keyed on one end of a shaft 22 mounted in bearings on a bracket 23 carried by the casing 9.

On the other end of this shaft 22 is keyed a bevel wheel 24 which meshes with two bevel wheels 25—26 loosely mounted on a shaft 27 supported in bearings on the bracket 23 at right angles to the shaft 22.

A clutch 28 feathered on the shaft 27 so as to be slidable thereon but always rotating therewith is provided at each end with teeth 28<sup>a</sup> and is of such a length that when the teeth at one end are engaged in correspondingly formed teeth on one of the wheels 25—26, the teeth at the other end are clear of similar teeth on the other of said wheels 25—26.

One end of the shaft 27 has keyed thereon a worm 29 which works in the teeth of a horizontal worm wheel 30 mounted on the pipe 1 or a fitting thereon so as to at all times remain stationary.

The stationary worm wheel 30 contains holes 31 arranged in a circle around the pipe 1 and in these holes, pins or pegs 32 are adapted to be inserted.

Also mounted on the bracket 23 carried by the casing 9 is a short vertical shaft 33, the latter having fixed on its upper end a horizontal arm 34 which

projects across the circle of holes 31 in the wheel 30.

A second arm 35 on the upper end of the vertical shaft 33 projects between the enlarged ends 36 of the clutch 28 on which are formed the teeth 28<sup>a</sup>.

On the lower end of the vertical shaft 33 and below the bracket 23 is keyed a further arm 37. The latter arm tapers towards its outer end, and has the same amount or degree of taper on both sides.

This arm 37 is adapted when the vertical shaft 33 is rotated to come in contact with a pointed projection 38 also having the same amount or degree of taper on both sides at the outer end of an arm 39 pivoted to the lower side of the bracket 23, in such a manner that the arm 39 is forced back against the action of a spring 40, until the point of the arm 37 passes or clears the point of the projections 38, whereupon the latter is pushed forward by the spring 40, and owing to the contact made between the two inclined surfaces, causes further turning movement to be imparted to the vertical shaft 33.

The means for breaking the jet of water issuing from the nozzle into spray comprises a rocking lever 41 pivoted at 42 on either the casing 9, fitting 3 or part moving therewith and having its upper portion bent as shown in Figure 2, so that its upper end is located below and slightly in front of the mouth of the nozzle.

A pointed screw 43 passing upwards through the upper end of the lever 41 is capable of being screwed upwards or downwards therein as desired.

The lower end 44 of the lever 41 is forked to pass over a cam 45 mounted on and rotating with the shaft 22, whereby the screw 43 when the sprayer is in operation is passed sideways to and fro through the issuing stream of water, and has the effect of breaking same into spray, and of causing the water to throw far and near.

If desired the sprayer can be constructed so as to be capable of rotating only in the one direction, in which case the clutch 28, shaft 27, and wheels 24, 25 and 26 are not needed, the shaft 22 being made longer and having keyed thereon a worm 46 to work in the worm wheel.

The operation of the apparatus is as follows, the water used for spraying passes through the casing 9 to the nozzle 11, and drives the turbine, whereby the shaft 22 is rotated. The teeth 28<sup>a</sup> at one end of the clutch 28 being engaged in the teeth of one of the wheels 25, 26, the engaged wheel is locked on and drives the

shaft 27, the effect of which is that the worm 29 working in the stationary worm wheel 30 causes the casing 9 and fitting 3 with the parts carried thereon to travel around the pipe. If it is desired that the sprayer shall make a full turn in one direction and then a full turn in the opposite direction, only one pin or peg 22 is placed in the wheel 30. When the clutch arm 34 strikes the pin or peg 32 the vertical shaft 33 is given a partial turning movement and the clutch engaging arm 35 is moved towards the opposite end of the clutch 28 until it comes in contact with an enlarged end and moves the clutch from engagement with which ever of the wheels 25—26 it was engaged with.

The same partial turning movement of the vertical shaft 33 causes the lower pointed arm 37 to press back the pivoted arm 39.

Shortly following the disengagement of the clutch 28 from the wheel 25 or the wheel 26 the point of the arm 37 clears the point of the projection 38 whereupon the latter springs forward and acting against the side of the arm 37 gives further turning movement to the vertical shaft 33, which results in the upper arm 35 forcing the clutch 28 into engagement with the opposite of the wheels 25—26 from which it was withdrawn, whereby the shaft 27 is caused to rotate in the reverse direction and the sprayer is caused to travel about the pipe in the reverse direction to which it did just previously.

When however the sprayer is required to operate backwards and forwards through a given portion of a circle, two pins or pegs 32 are used. These are placed in the wheel 30 the necessary distance apart and each time the arm 34 strikes a pin or peg 32, a reversal of the travel of the sprayer about the pipe 1 is effected.

The sprayer constructed as shown in the drawing can be caused to rotate continuously in the one direction by locking the clutch 28 in whichever of the wheels 25—26 it is desired and not inserting any pins or pegs 32 in the wheel 30.

During the whole of the spraying operations the altitude of the outer portion 12<sup>a</sup> of the nozzle 11 is being adjusted to lengthen or shorten the throw of the water according to the outline of the area by the arm 12 rising to pass over projections on and being lowered by entering depressions in the plate 14, said projections and depressions being provided at points corresponding with portions projecting from hollows in the outline of the area being watered.

The screw 43 moves continuously to and fro in the jet of water, no matter in what direction the sprayer is travelling.

5 Where areas having regular outlines or boundaries are to be watered, the jointed nozzle 11 need not be used, as an ordinary rigid nozzle will serve as well.

10 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A water sprayer, comprising a turbine fitted with a discharge nozzle and operated by water passing to the latter, to drive gearing whereby the sprayer is given rotary motion.

2. In a water sprayer according to Claim 1, a discharge nozzle the mouth of which is elevated and depressed as the turbine revolves.

3. In a water sprayer according to any of the preceding claims, means for reversing the travel of the turbine about the water pipe.

4. A water sprayer according to any of the preceding claims, comprising a water pipe about which the turbine carrying the discharge nozzle is rotatable; a stationary worm wheel on said pipe and a worm drive on the turbine shaft; and gearing between said worm wheel and the worm drive on the turbine shaft, whereby the turbine is rotated about the pipe on water passing through the turbine.

5. A water sprayer, according to Claim 4, wherein a reversing clutch is placed in the gearing between the worm drive on the turbine shaft and the worm wheel on the water pipe.

6. In a water sprayer according to Claim 1 or 2, a cock in the discharge nozzle, a fixed plate having a portion shaped to correspond with the outline of the area being watered; and an arm on the mouthpiece of the nozzle, kept in contact with the shaped portion of said plate.

7. In a water sprayer according to any of the preceding claims, means for breaking the jet of water into spray, comprising a lever actuated by a cam so that a

projection from one end of the lever is worked to and fro in the jet of water.

8. A construction of the means for breaking the jet of water into spray claimed in Claim 7 in which the lower end of the lever is forked to pass over a cam; and the upper portion of the lever carries an adjustable projection entering the jet of water.

9. In a water sprayer according to Claim 1, a construction of the turbine comprising a casing; a disc having a hub mounted on a shaft passing through the casing; a circular wall on said disc at a distance from the edge thereof; blades outside said wall curved to meet the incoming water and ports through said wall between the blades.

10. In a water sprayer according to Claim 1, the combination of a worm on the turbine shaft driving a worm wheel on a shaft supported by a bracket carried by the turbine casing; a bevel wheel on said last mentioned shaft meshing with two bevel wheels loosely mounted on a cross shaft supported by said bracket; a worm on said cross shaft working in a stationary worm wheel on said water pipe; a clutch feathered on said cross shaft between the bevel wheels thereon; and means for actuating the clutch so as to cause the turbine to reverse its movement about the vertical pipe after having travelled a predetermined distance.

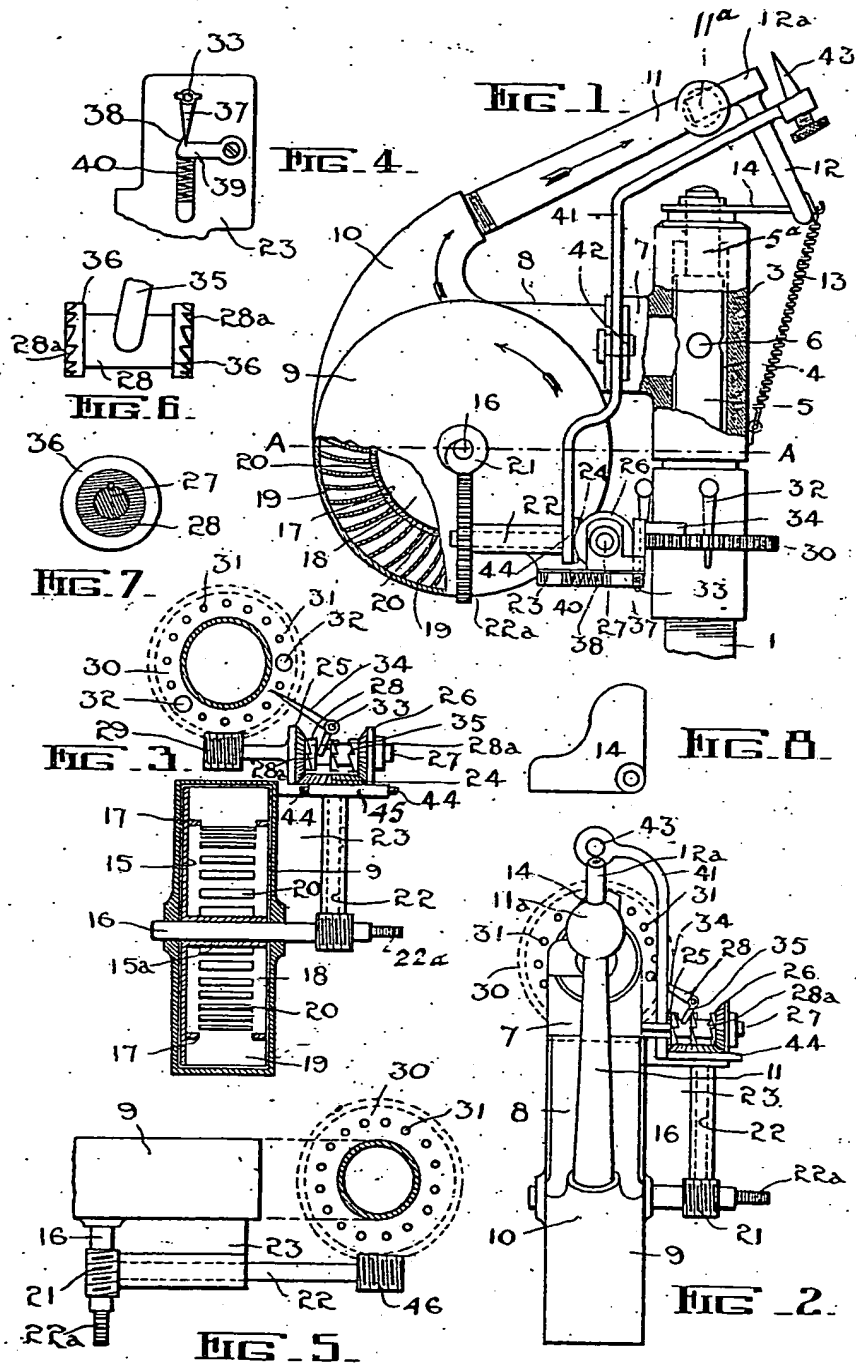
11. In a water sprayer according to Claim 10, a construction of the means for actuating the clutch comprising in combination a vertical shaft carried by a portion adapted to travel about the pipe; an arm at the upper end of said shaft engaging said clutch, a second upper arm adapted to come in contact with pins adjustable in a fixed part on said water pipe; and a lower pointed arm on said vertical shaft adapted to move and to be moved by a pointed projection on a spring pressed arm pivoted on the portion supporting said shafts.

Dated the 8th day of March, 1923.

S. SOKAL,

1, Great James Street, Bedford Row,  
London, W.C.,  
Chartered Patent Agent.

[This Drawing is a reproduction of the Original on a reduced scale]



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